THE GIANT CUTTLE-FISHES OF NEWFOUNDLAND AND THE COMMON SQUIDS OF THE NEW ENGLAND COAST.

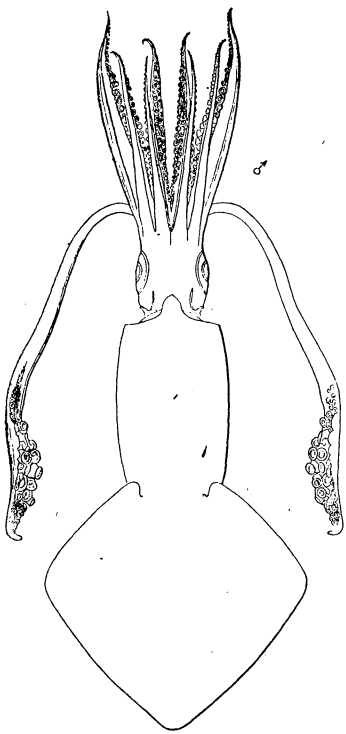
BY PROFESSOR A. E. VERRILL.

THE various accounts of the appearance and capture of several gigantic cuttle-fishes or "squids" on the coast of Newfoundland, that have recently been published in the newspapers, have excited an unusual interest in animals of this kind. I have been so fortunate as to obtain for examination and description the jaw of the huge specimen found floating at the surface on the Grand Banks in 1871, and referred to by Dr. Packard in his interesting article in a former number of the NATURALIST (vol. vii, No. 2, p. 91), and also the jaws and two of the large suckers of a gigantic specimen recently obtained in Bonavista Bay, Newfoundland,* and parts of another smaller specimen, captured in December near St. John. In a future article I propose to describe and figure these remarkable specimens, and will, therefore, at present, merely state that these remains show that two distinct kinds of gigantic squids exist on the coast of Newfoundland. One of these, represented by the jaw obtained in 1871, is a comparatively elongated species, having, according to the measurements made, a body about fifteen feet long and nineteen inches in diameter, with the ordinary arms about ten feet in length and seven inches in diameter (the two long extensile arms of unknown length). This is probably the *Architeuthis monachus* of Steenstrup, as stated by Dr. Packard. The other is represented by the jaws and suckers in my possession and by one of the long extensile arms preserved in the museum at St. John, Newfoundland, which was cut off from the individual that attacked the boat, as described in the February number of the NATURALIST, p. 120. Of this, I also have some of the suckers. Possibly a specimen, captured at Coombs Cove, was the same individual that attacked the boat, for, when captured, it had lost one of its long arms, and the one

*For these unique specimens I am indebted to Prof. Baird, of the Smithsonian Institution.

remaining agreed in dimensions with the one preserved. This is a comparatively stout species, having, according to the measurements made, of the last named individual, a body about ten feet long and three or four feet in diameter; the two long, slender, extensile arms were forty-two feet long; the shorter arms about six feet long and nine inches in diameter. One of the jaws of this species resembles the one figured by Dr. Packard (vol. vii, p. 93, fig. 10) as probably *Architeuthis dux* Steenstrup, and may be the same species.

Fig. 54.



Loligo pallida, one-half nat. size.

A smaller specimen was captured in December, in Logic Bay, about three miles from St. John, in herring nets. Photographs were made of this: one showing the entire body, somewhat mutilated anteriorly; the other showing the head with the ten arms attached. The body of this specimen was over seven feet long, and between five and six feet in circumference; the caudal fin was twenty-two inches broad, but short, thick, and emarginate posteriorly on each side, the end of the body being acute; the two long tentacular-arms were twenty-four feet in length, and two and a half inches in circumference, except at the broader part near the end; the tips slender and acute; the largest suckers 1·25 inch in diameter, with serrated edges; the eight short arms were each six feet long; the largest two were ten inches in circumference at base; the others were nine, eight and seven inches. These short arms taper to slender acute tips, and each bears about one hundred large, bell-shaped suckers, with serrated margins. Each of the long arms bears about one hundred and sixty suckers on the broad terminal portion, all of which are denticulated; the largest

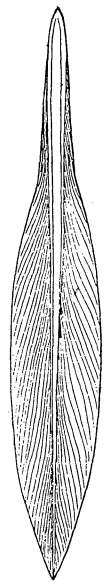
ones, which form two regular alternating rows, of twelve each, are about an inch in diameter.

The general form and structure of these giants may be best understood by comparison with the common small kinds found on our shores, to which, in fact, the large ones are closely allied; moreover, their habits are in many respects quite similar.

Of the smaller "squids," at least six species occur on the coast of New England, but some of these are quite rare.

Loligo pallida Verrill (figs. 54, 55). On the southern coast of New England, especially in Long Island Sound and near New York, the species represented by figs. 54 and 55 often occurs in large numbers, and is frequently captured in great quantities in seines, with menhaden or "bony-fish," upon which it probably feeds.

Fig. 55.



Quill of Loligo pallida.

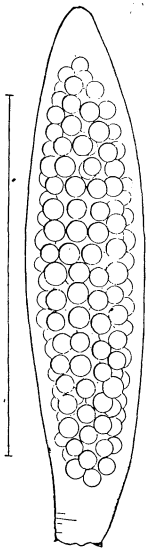
This species I have recently described under the name of *Loligo pallida*.*

The body is stout, tapering rapidly backward. Anterior border of the mantle with a prominent, obtusely rounded, median dorsal lobe, from which the margin recedes on each side; on the lower side the margin is concave in the middle, with a projecting angle on each side. Caudal fin large, about as broad as long, more than half as long as the body. Siphon large and stout; upper pair of arms considerably smaller and shorter than the others, slender at tips, margined along the inner dorsal ridge with a thin membrane. Second pair of arms stouter and longer, triquetral, slightly margined on the outer angle. Third pair much stouter and considerably longer, with a membranous fold along the middle of the outer surface, which expands into a thin membrane toward the end. Tentacular arms long and slender, in extension longer than the body, the portion that bears suckers forming about one-third the whole length; in the female the larger suckers on the middle of this portion are not so large as the largest on the other arms, and are arranged in about four rows; those near the tips of the arms are very small and crowded.

*Report of the U. S. Commissioner of Fish and Fisheries, for 1871 and 1872, p. 635, plate 20, figs. 101, 101*a*. The description and figures are here reproduced with the consent of Professor Baird.

In the male the principal suckers of the tentacular arms are very much larger than in the female, and considerably exceed those of the other arms; they form two alternating rows along the middle of the arm, and external to them there is a row of smaller suckers on each side, alternating with them; the suckers toward the tips are very numerous, small and crowded; outside of the suckers, on each side, there is a marginal membrane with a scalloped edge; another membranous fold runs along the outer surface and expands into a broad membrane near the end; the arms of the ventral pair are intermediate in length between those of the second and third pairs. Ground-color of the body, head, arms and fins, pale, translucent, yellowish white; entire ventral surface pale, with small, distant, brownish circular spots, which are nearly obsolete on the siphon and arms; the upper surface is covered with pale brown, unequal, circular spots, which are not crowded, having spaces of whitish between them; the spots are more sparse on the head and arms, but somewhat clustered above the eyes. The general appearance of the animal when fresh is unusually pale and gelatinous. The "pen" is broad, quill-shaped, translucent and amber-colored. A medium-sized male specimen, preserved in alcohol, measures 145^{mm} from the base of the dorsal arms of the posterior end of the body; length of body, 120^{mm}; length of caudal fin, 70^{mm}; breadth of fin, 75^{mm}; length of first pair of arms, 42^{mm}; of second pair, 50^{mm}; of third, 60^{mm}; of tentacular arms, 150^{mm}; of ventral pair, 53^{mm}.

Fig. 56.



Egg Capsule of L. Pealii.

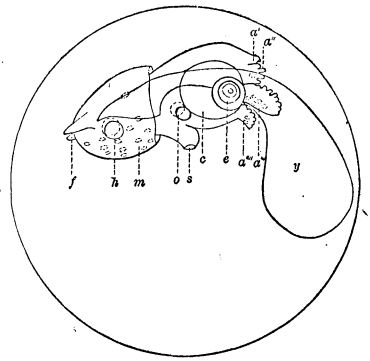
Loligo Pealii Lesueur * (figs. 56, 57). This is similar to the preceding species in structure, but is more elongated in form and much more highly colored. The color when living is very changeable, owing to the alternate contractions of the spots or color-vesicles, but these spots are much crowded, especially on the back, and the red and brown shades predominate, so as to give a general reddish or purplish-brown color.

*This species is well represented by plate 25, fig. 340, in the last edition of Gould's Invertebrates. This figure was erroneously referred to *Ommastrephes Bartramii* by Mr. Binney.

This species when full-grown is over a foot in length, though most of those taken are smaller. It is very abundant in Vineyard Sound and Long Island Sound, and is taken in great quantities in the seines and fish-pounds.

The eggs of this and the allied species are contained in many elongated gelatinous capsules (see fig. 56), which are attached by one end to some common support, from which they radiate in all directions. These clusters are often six or eight inches in diameter, containing hundreds of the capsules each of which is from two to four inches long, and filled with numerous eggs. These are deposited in June and July. By the 20th of June many of these eggs contain embryos in different stages of development (see fig. 57).

Fig. 57.



Embryo of L. Pealii.*

Even at this early period some of the pigment vesicles are already developed in the mantle and arms, and during life, if examined under the microscope, these orange and purple vesicles may be seen to contract and expand rapidly and change colors, as in the adult, only the phenomena may be more clearly seen, owing to the greater transparency of the skin in the embryos. They are, therefore, beautiful objects to observe under the microscope. At this stage of development the eyes were brown. In these embryos the yolk is finally absorbed through the mouth, which corresponds, therefore, in this respect, to an "umbilicus." The more advanced of these embryos were capable of swimming about, when removed from the eggs, by means of the jets of water from the siphon.

During July and August the young, from a quarter of an inch to an inch in length, swim free at the surface, and may often be taken in immense quantities with towing nets. They were particularly abundant last summer, in Vineyard Sound, where large numbers

* *a'*, *a''*, *a'''*, *a''''*, the right "arms" belonging to four pairs; *c*, the side of the head; *e*, the eye; *f*, the caudal fins; *h*, the heart; *n*, the mantle in which color-vesicles are already developed and capable of changing their colors; *o*, the internal cavity of the ears; *s*, the siphon; *y*, the portion of the yolk not yet absorbed.

were captured by Mr. Vinal N. Edwards, for the U. S. Fish Commission. These young squids are devoured in inconceivable numbers by fishes of many kinds, and also by the larger jelly-fishes, and many other marine animals.

The larger sizes, and even the adults, are also greedily devoured by blue-fish, black-bass, striped-bass, weak-fish, mackerel, cod, and many other kinds of fishes. Therefore these "squids" are really of great importance as food for our most valuable market fishes.

Ommastrephes illecebrosa. This is the most common squid north of Cape Cod, and extends as far south as Long Island, and Newport, Mass. It is very abundant in Massachusetts Bay, the Bay of Fundy, and northward. It differs from the species of *Loligo* in having distinct eyelids, and also in the more elongated form of its body and the shorter caudal fin. Its internal shell or "bone" is slender in the middle and expanded at each end, instead of being quill-shaped, as in the two preceding species. Messrs. S. I. Smith and Oscar Harger observed it at Provincetown, Massachusetts, among the wharves, in large numbers, July 28, 1872, engaged in capturing and devouring the young mackerel, which were swimming about in "schools" and at that time were about four or five inches long. In attacking the mackerel they would suddenly dart backward among the fish with the velocity of an arrow, and as suddenly turn obliquely to the right or left and seize a fish, which was almost instantly killed by a bite in the back of the neck with their sharp beaks. The bite was always made in the same place, cutting out a triangular piece of flesh, and was deep enough to penetrate to the spinal cord. The attacks were not always successful, and were sometimes repeated a dozen times before one of these active and wary fishes could be caught. Sometimes, after making several unsuccessful attempts, one of the squids would suddenly drop to the bottom, and, resting upon the sand, would change its color to that of the sand so perfectly as to be almost invisible. In this way it would wait until the fishes came back, and when they were swimming close to or over the ambuscade, the squid, by a sudden dart, would be pretty sure to secure a fish. Ordinarily, when swimming,

* This species is not well figured in the last edition of Gould's Invertebrates. Plate 25, fig. 339, which Mr. Binney refers to it, really represents a Loligo. Plate 26, figs 341—344 (erroneously referred to *Loligopsis pavo*), was probably made from a specimen of this species, but if so the long arms were incorrectly drawn.

they were thickly spotted with red and brown, but when darting among the mackerel they appeared translucent and pale. The mackerel, however, seemed to have learned that the shallow water was the safest for them, and would hug the shore as closely as possible, so that in pursuing them many of the squids became stranded and perished by hundreds, for when they once touch the shore they begin to pump water from their siphons with great energy, and this usually forces them farther and farther up the beach. At such times they often discharge their ink in large quantities. The attacks on the young mackerel were observed mostly at or near high water, for at other times the mackerel were seldom seen, though the squids were seen swimming about at all hours; and these attacks were observed both in the day and evening. But it is probable, from various observations, that this and the other species of squids are partially nocturnal in their habits, or at least are more active in the night than in the day. Those that are caught in the pounds and weirs mostly enter in the night, evidently while swimming along the shores in "schools." They are often found in the morning stranded on the beaches in immense numbers, especially when there is a full moon, and it is thought by many of the fishermen that this is because, like many other nocturnal animals, they have the habit of turning toward and gazing at a bright light, and since they swim backwards they get ashore on the beaches opposite the position of the moon. This habit is also sometimes taken advantage of by the fishermen, who capture them for bait for cod-fish; they go out in dark nights with torches in their boats and by advancing slowly toward a beach drive them ashore. They are also sometimes taken on lines, adhering to the bait used for fishes. Their habit of discharging an inky fluid through the siphon, when irritated or alarmed, is well known. This squid, like the preceding, is eagerly pursued by many voracious fishes, even when adult. Among its enemies are the full grown mackerel, who thus retaliate for the massacre of their own young by the squids.

The specimens observed catching young mackerel were mostly eight or ten inches long, and some of them were still larger.

A fresh specimen, caught in Casco Bay, had the following proportions: Length of head and body, not including the arms, 221^{mm}; length of caudal fin, 86^{mm}; breadth of fin, 90^{mm}; diameter of body, 35^{mm}; length of upper arms, 80^{mm}; of second pair,

100^{mm}; of third pair, 100^{mm}; of extensile arms, 182^{mm}; of the ventral pair, 90^{mm}.

The length of time required for these squids to become full grown is unknown, as well as the duration of their lives, but as several distinct sizes were taken in the pounds, and those of each school were of about the same size, it is probable that they are several years in attaining their full size. A specimen, recently caught, at Eastport, Maine, was pale bluish-white, with green, blue and yellow iridescence on the sides and lower surface; the whole body was more or less thickly covered with small, unequal, circular, orange-brown and dark brown spots, having crenulate margins; these spots are continually changing in size, from mere points, when they are nearly black, to spots 0·04 to 0·06 of an inch in diameter, when they are pale orange-brown, becoming lighter colored as they expand. On the lower sides the spots are more scattered, but the intervals are generally less than the diameter of the spots. On the upper side the spots are much crowded and lie in different planes, with the edges often overlapping, and thus increasing the variety of the tints. Along the middle of the back the ground-color is pale flesh-color, with a median dorsal band, along which the spots are tinged with green, in fine specks. Above each eye there is a broad lunate spot of light purplish red, with smaller brown spots. The upper surface of the head is deeply colored by the brown spots, which are here larger, darker, and more crowded than elsewhere, and situated in several strata. The arms and fins are colored like the body, except that the spots appear to be smaller. The suckers are pure white. The eyes are dark blue-black, surrounded by an iridescent border.

The remaining species are comparatively rare, and are seldom seen on our shores, their proper homes being probably farther north, or in mid-ocean.

Of the eight-armed group of Cephalopods, only one species, the *Octopus Bairdii* V., has hitherto been found on the New England coast (see AMER. NATURALIST, vol. vii, p. 394, July, 1873). It is not improbable that several other species of squids and Octopi remain to be discovered on our coast. Even the gigantic species taken at Newfoundland may also frequent the northern coasts of New England, or the deep water, off shore, for we really know very little of the active free-swimming animals that inhabit the great depths and cannot be taken with the dredge.